Posterior Cruciate Ligament Avulsion Repair

Essay

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Abstract

The PCL is approximately twice as strong as the anterior cruciate ligament (ACL) and represents the strongest ligament of the knee, which plays an important role in stabilizing the knee joint.

A rupture of PCL often leads to an increased posterior tibial translation with full laxity at 90 degrees of flexion and a small rotation or lateral instability. This results in posterior subluxation of the tibia, wherein an abnormal pressure on the in medial and patellofemoral compartments, is created, leading to chronic pain and early cartilage degenerative arthritis and increased risk of meniscal tear.

Due to its strong fibers structure, PCL ruptures are less frequent than ruptures of other knee ligaments. An avulsion fracture of the PCL usually occurs in a small subgroup of PCL injuries where is tibial avulsion fractures are more common than femoral avulsion fractures.

Key Words :

Anterior tibial – fabella - popliteal tendon .

CONTENTS

A Privation list

PCL	*posterior cruciate ligament*
ACL	*anterior-cruciate ligament*
AL	*The antero-lateral bundle*
PM	*posterior-medial bundles*
AMFL	*Anterior meniscofe-moral ligament*
PMFL	*Posterior meniscofe-moral ligament*
Smcl	*the superficial medial collateral ligament*
POL	*posterior oblique ligament*
LCL	*lateral collateral ligament*
PLC	*the postreriolateral cornal*
PMC	*the postero-medial corner*
MFC	*the medial femoral condyle*
MRI	*magnetic resonance imaging*
HTO	*high tibial osteotomy*
CPM	*continuous passive motion*
CT	*computed tomography*
AL	*arcuate ligament*
AT	*Anterior tibial*
Fa	*fabella*
FCL	*fibular collateral ligament*
LG	*lateral gastrocnemius muscle*
MG	*medial gastrocnemius muscle*
OPL	*oblique popliteal ligament*
PL	*plantaris longus muscle*
Po	*popliteus muscle.*

POL	*posterior oblique collateral ligament*
PT	*popliteal tendon*
Sm	*semimembranosus*
TCL	*tibial collateral ligament*

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Introduction

The posterior cruciate ligament (PCL) is the primary restraint to posterior tibial translation and a secondary restraint to external tibial rotation. At both 30° and 90° of flexion, the PCL resists 85% to 100% of posteriorly directed forces.[1] The Posterior cruciate ligament (PCL) has an anterolateral and a posteromedial bundle.[2] It originates approximately 10 mm inferior to the joint line of the posterior tibia and extends in an antero-medial direction to attach to the lateral aspect of the medial femoral condyle. The antero-lateral bundle is tight in flexion, while the postero-medial bundle is tight in extension.[3] The meniscofemoral ligaments act as secondary stabilizers to posterior translation of the tibia, and with the knee at 90° of flexion, they provide approximately 28% of the total force resisting posterior tibial translation.[4]

Posterior cruciate ligament (PCL) injuries account for 3% to 23% of knee injuries. In a trauma setting, they are responsible for up to 40% of all knee ligamentous injures. However, because they are often asymptomatic, PCL injuries are underdiagnosed. The incidence of PCL injuries varies widely in the literature and has been reported to be as low as 3% in the general population to as high as 37% of all patients presenting with knee hemarthroses in a major trauma center Despite the lack of studies regarding the epidemiology of PCL injury, the available data suggest that there are two distinct cohorts

of patients who sustain PCL injuries: athletes involved in contact sports and individuals involved in high-energy trauma.[5]

The magnitude of posterior translation is assessed and this measurement is used to grade the degree of laxity. Posterior displacement of 0 to 5 mm is designated a grade I injury, 5 to 10 mm a grade II injury, and greater than 10 mm a grade III injury.[6] For mild injuries (grade I and II), physical therapy focused on strengthening quadriceps and avoiding unopposed hamstring contraction will usually render good results in most patients; however, some individuals will have persistent symptoms or develop pain and arthrosis with time. Currently, there are no available criteria to predict which patients with mild injury will have a poor outcome following non-operative therapy. Moreover, there is no definitive evidence that surgery improves the natural history of mild PCL insufficiency. In patients with severe symptomatic laxity (grade III) or combined injury, surgical reconstruction is necessary. Single-bundle reconstruction through a tibial tunnel has had variable results, but outcomes appear to be improving with improved surgical techniques and more defined patient selection.[6]

There is no consensus about the primary repair of PCL injuries, although late reconstruction in experienced hands is regaining popularity. One fact is however clear, tibial avulsion gives the best results after stable fixation. The fragment can be fixed with either a screw or suture,

using either an open approach or arthroscopy.[7] Surgical fixation of the bony avulsion by either a screw or K-wire has given almost uniformly excellent results.[7] where as non-surgical treatment has a significant incidence of morbidity in form of residual instability and early degenerative arthritis. Some orthopedics surgeons are apprehensive about treating tibial avulsions of the PCL because of their unfamiliarity with the standard posterior approach to the knee and the potential for damage to the important neurovascular structures. Many series dealing with PCL injuries have followed the standard posterior approach through the popliteal fossa as described by Abbott, [9] which is a complex approach requiring a meticulous dissection of the neurovascular bundle in the popliteal fossa and time consuming. Further modifications were later described by Trickey, Ogata, McCormick, & Burk and Schaffer aiming at decreasing the surgical dissection and time.[9]

The aim of this essay is to review and study literatures regarding the diagnosis of PCL injuries and management of PCL avulsion as well as the techniques used in posterior curciate ligament avulsion repair.

Anatomy of posterior cruciate ligament

The posterior cruciate ligament (PCL) is the largest of the intra-articular ligaments and travels from the lateral aspect of the medial femoral condyle to the posterior tibia.[10] Fig. (1)The PCL lies within the joint capsule of the knee, yet it is considered extra-articular because it is enclosed within its own synovial sheath. The PCL is 32 to 38 mm long, with a cross-sectional area of 11-13 mm^2 at its midpoint. It is intimately related to the surrounding capsular and ligamentus structures of the posterior knee including the anterior-cruciate ligament (ACL), articular capsule, menisci, ligaments of Humphrey and Wrisberg, and the major neurovascular structures of the leg.[10]

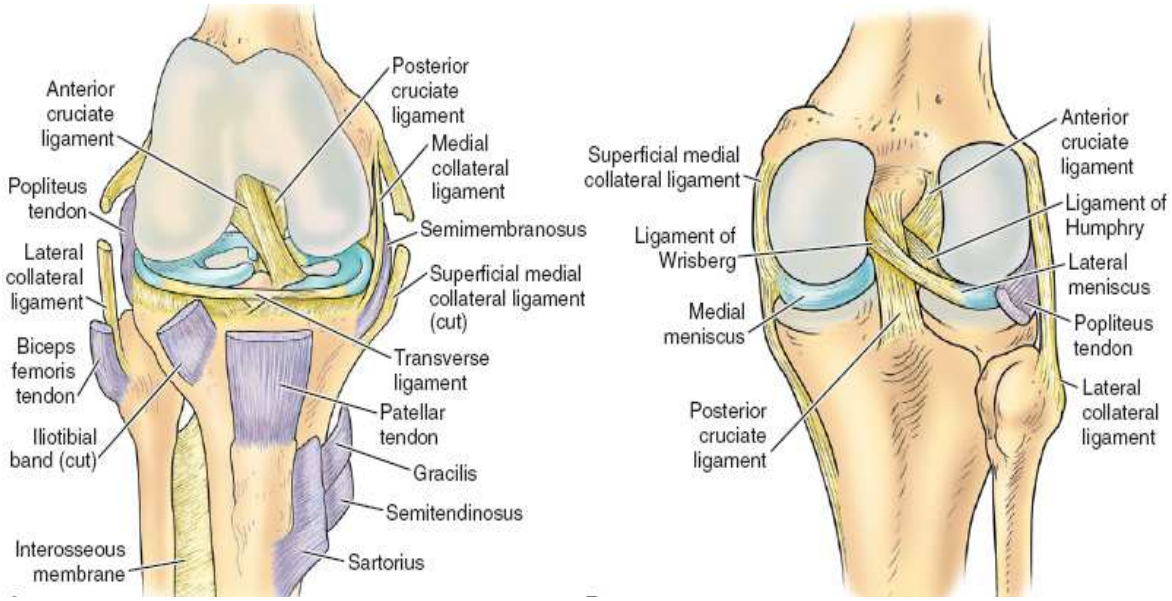

Fig. (1): anatomical structures anterior and posterior cruciate ligaments of the knee anterior view of the knee and posterior view respectively [11]

The posterior cruciate ligament (PCL) consists of longitudinally oriented collagen fibers that are most narrow in the midsubstance, fanning out superiorly at the femoral attachment, and to a lesser extent at the tibial insertion. The fibers of the PCL attach to the femoral footprint in a lateral to medial orientation, and anterior to posterior on the tibia.[10]

The investigators claim that the PCL has a monofascicular structure.[12-14] The most common view presents the ligament as a structure containing 2 bundles which are usually referred to as the anterolateral and posteromedial parts(AL-PCL and PM-PCL).[15-21] The anterolateral PCL is stretched while flexed, relaxed while extended, and the posteromedial PCL is visibly stretched while extended and slightly relaxed while flexed.[2,10,21,22]

Posterior cruciate ligament attachment

Proper knowledge of the topography of femoral and tibial insertion sites of the PCL assists in proper graft placement during single- and double bundle reconstruction techniques.[23] Fig.(2).

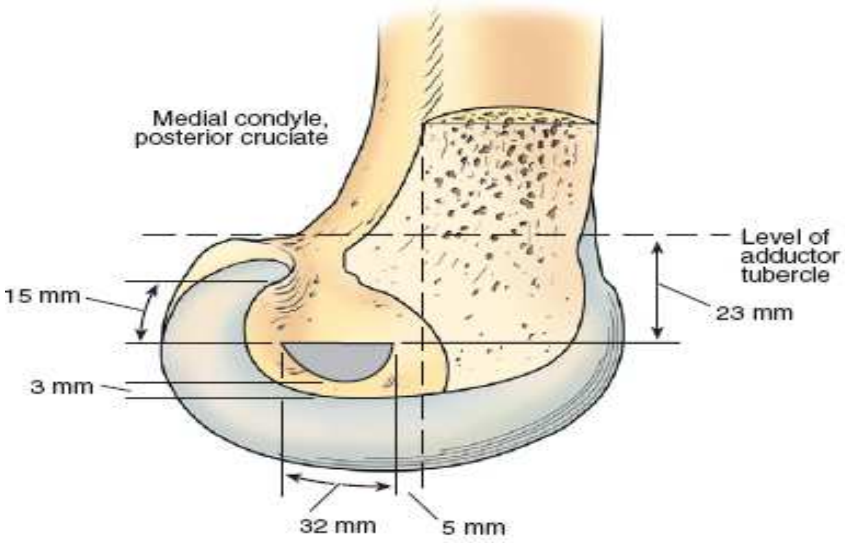

Fig.(2): Attachments of the posterior cruciate ligaments to the femur.[11]

The femoral footprint of the PCL exhibits a circular attachment in the intercondylar surface anteriorly, adjacent to the articular cartilage of the medial femoral condyle. The posterior aspect of the footprint inserts on the flat intercondylar surface. The notch orientation of the femoral attachment when viewed in the coronal plane is approximately 4 o'clock to 12 o'clock in a right knee and 8 o'clock to 12 o'clock in the left knee.[24] The antero-lateral bundle (AL) and posterior-medial (PM) bundles insert on distinct planes within the notch characterized by a change in slope between each insertion site. A medial intercondylar ridge defines the proximal extent of the PCL insertion and a medial bifurcate ridge separates the insertion sites of each bundle. The AL bundle inserts on the anterloateral aspect of the intercondylar notch and is more easily visualized on a standard arthroscopic image, whereas the PM bundle inserts posteriorly and is seen infero-medially on an arthroscopic view.[25]